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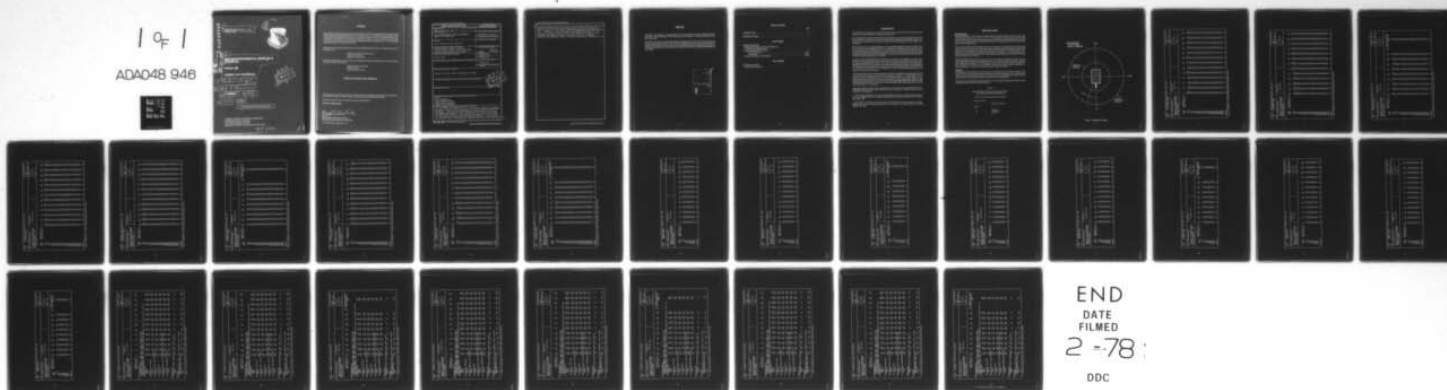
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Volume 108

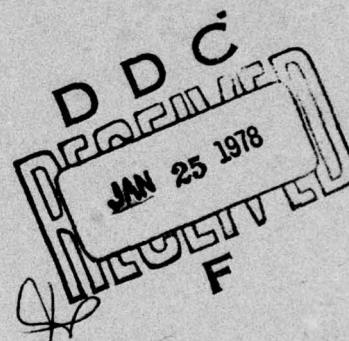
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HANDBOOK.

Volume 108.

A/M32C-4 Air Conditioner.



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10 Mike A. Farinacci

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AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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FOR THE COMMANDER


HENNING E. VON GIERKE
Director
Biodynamics and Bionics Division
Aerospace Medical Research Laboratory

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The A/M32C-4 Air Conditioner is an electric motor driven unit providing heating or cooling to aircraft cockpits or electronic equipment during ground maintenance. This report provides measured data defining the bioacoustic environments produced by this unit operating inside a large aircraft hanger at normal rated conditions. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech		

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interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of this handbook, USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application, AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723104, Measurement and Prediction of Noise Environments of Air Force Operations.

The author acknowledges the efforts of Mr. Robert T. England and Mr. Robert G. Powell who conducted the field measurements, and Mr. John N. Cole who established the data analysis requirements and assisted in the preparation of this report. Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton assisted in the mechanics of data processing, and Mrs. Norma Peachey typed and prepared the graphics.

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NEAR-FIELD NOISE

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INTRODUCTION

The A/M32C-4 Air Conditioner is an electric motor-driven unit providing heating or cooling to aircraft cockpits or electronic equipment during ground maintenance.

This volume provides measured data defining the bioacoustic environments produced by this unit. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the A/M32C-4 air conditioner.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15C temperature, 70% rel humidity, 0.760 meters Hg barometric pressure) to derive comparable data for other meteorological conditions. *Refer to Volumes 1 and 2* (references 1 and 2) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; Autovon 78-53675 or 78-53664; Commercial (513) 255-3675 or (513) 255-3664.

1. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.

2. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 2: Procedure to Evaluate Effects of Non-standard Meteorological Conditions on Far-Field Noise*, AMRL-TR-75-50 (2), AMRL, WPAFB, OH, 1975.

NEAR-FIELD NOISE

MEASUREMENTS

A standard A/M32C-4 Air Conditioner was operated inside, and approximately in the center of a large aircraft hanger (190.5 m long \times 95.1 m wide \times 18.3 m high) on a concrete floor at normal rated conditions. The hanger walls and ceiling were not acoustically treated. No aircraft were in the vicinity of the unit while being measured. No far-field acoustic data were acquired because of the relatively close proximity of the hanger walls.

Figure 1 identifies 36 noise measurement locations at a height of 1.5 meters above the concrete apron (nominal ear level of ground crew). The 0 degree reference direction passes through the tow bar. These locations are in the acoustic near-field of the source where the sound wave fronts generally do not spherically diverge and the source appears to be spatially distributed (i.e., not a point source). Consequently, these near-field data cannot be extrapolated to longer distances but do properly define the levels at locations close to the unit.

Near-field measurements were also made at ear level at the operator control panel. Table 1 lists the numeric/alphabetic designators used on the data pages in this report to identify the operator measurement location and test conditions. The designator 1/A means operator location 1 and test condition A. Such a descriptor is essential in many handbook volumes that involve multiple combinations of locations/conditions. It is used in this report to maintain format consistency.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the A/M32C-4 unit at the 37 specified, near-field locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures in Table 3 which are widely used to assess the effects of noise on personnel and their performance.

For data at other intermediate near-field locations (i.e., for radial distances less than 4 meters) you can interpolate between the 36 measured data points.

TABLE 1

MEASUREMENT LOCATION AND TEST CONDITION FOR OPERATOR NOISE MEASUREMENTS

A/M32C-4 Air Conditioner, Edwards AFB, 22 Sep 1972

Measurement Location

1

Operator Control Panel

Operation

A

Vent Cycle

B

Cooling Cycle

C

Heat Cycle

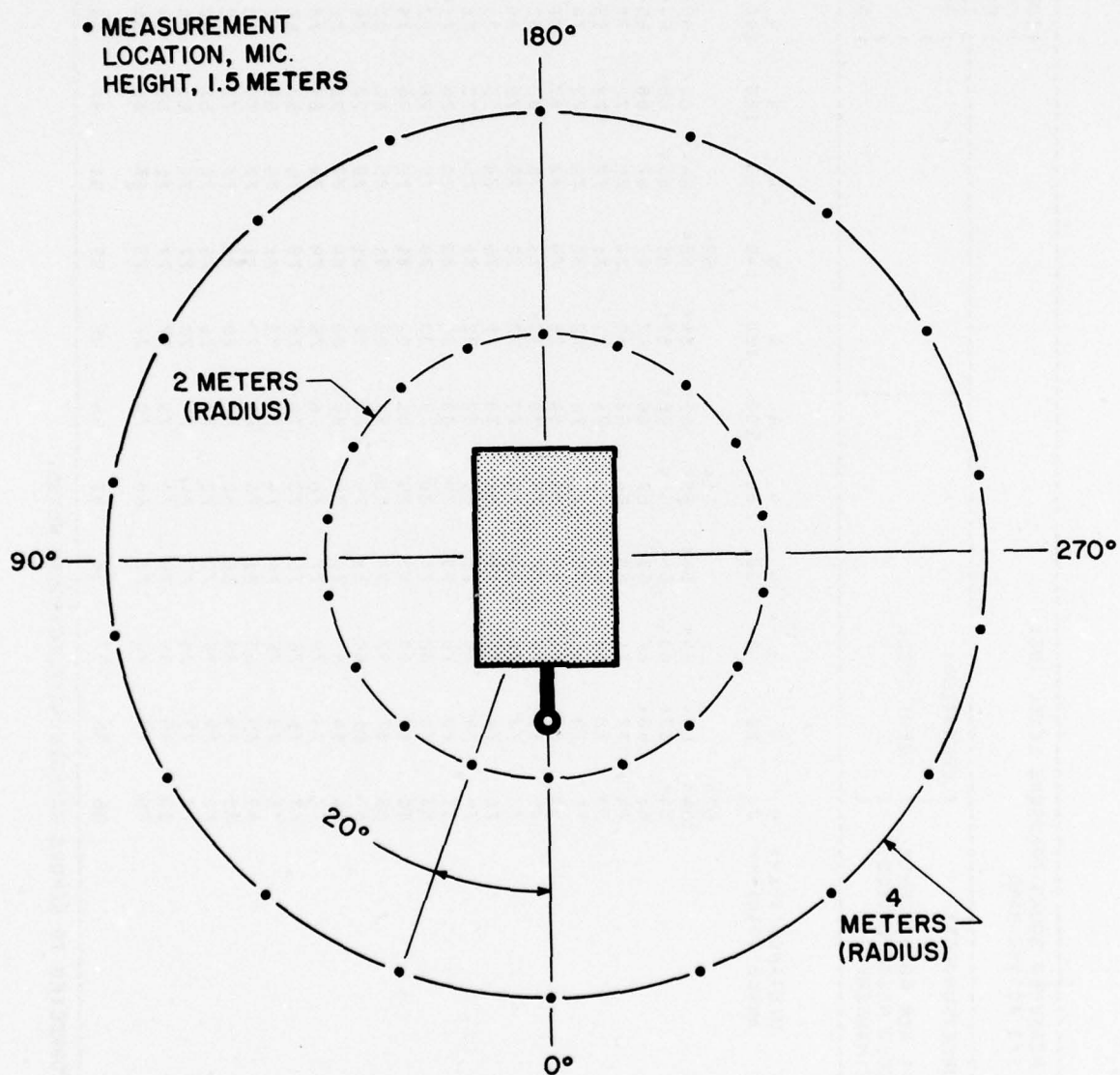


Figure 1. Measurement Locations

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
1/3 OCTAVE BAND										OMEGA 3.2									
										TEST 71-020-330									
										RUN 01									
										26 AUG 74									
										PAGE F1									

TABLE: MEASURED SOUND PRESSURE LEVEL (DB) 1/3 OCTAVE BAND										IDENTIFICATION:									
2										OMEGA 3.2 TEST 71-020-330 RUN 02 26 AUG 74 PAGE F2									
NOISE SOURCE/SUBJECT: (OPERATION:)																			
A/M32C-4 AIR CONDITIONER (VENT CYCLE)																			
NEAR FIELD NOISE LEVELS ()																			
(INSIDE HANGER) ()																			
</																			

TABLE: MEASURED SOUND PRESSURE LEVEL (DB) 1/3 OCTAVE BAND												IDENTIFICATION:	
2													
NOISE SOURCE/SUBJECT: (OPERATION:)												OMEGA 3.2	
A/M320-4 AIR CONDITIONER (VENT CYCLE)												TEST 71-020-330	
NEAR FIELD NOISE LEVELS ()												RUN 03	
(INSIDE HANGER)												26 AUG 74	
												PAGE F3	
DISTANCE (M)--> 160													
FREQ (HZ)												2 OPERATOR LOCATION 1/A	
25	62<	63<	70<	67<	66<	62<	66<	66<	72	72	70<		
31.5	69<	65<	67<	68<	69<	69<	69<	73	75	74	74		
40	71	68	69	70	69	68	66<	66<	68	70	70		
50	71	69	70	67	67	66	65	65	68	69	69		
63	74	73	72	72	71	68	68	70	74	75	75		
80	76	77	76	76	74	72	71	74	73	76	76		
100	75	77	78	78	78	77	74	74	73	74	74		
125	87	92	92	89	94	93	86	91	89	89	89		
160	84	88	87	86	87	87	81	84	82	82	82		
200	79	78	83	85	86	85	78	78	78	80	80		
250	79	78	87	86	87	87	84	84	83	83	83		
315	78	79	81	79	84	84	82	79	79	81	81		
400	78	83	82	79	80	80	80	81	81	88	88		
500	81	77	80	85	84	81	81	87	88	91	91		
630	80	79	78	84	82	81	84	80	87	89	89		
800	82	82	90	93	96	92	88	89	88	88	88		
1000	77	75	78	81	83	81	81	80	81	86	86		
1250	78	76	77	78	83	82	85	77	81	88	88		
1600	76	72	71	76	79	78	76	76	78	84	84		
2000	75	71	71	76	78	76	73	72	77	81	81		
2500	77	72	69	75	78	76	73	71	74	79	79		
3150	78	73	71	75	79	79	78	80	82	91	91		
4000	77	74	73	76	81	81	81	84	89	96	96		
5000	73	67	64	67	70	69	68	68	72	81	81		
6300	71	66	63	68	72	72	70	70	76	87	87		
8000	71	70	66	71	78	77	75	76	82	94	94		
10000	65	60	58	62	65	64	64	64	69	82	82		
OVERALL	93	95	96	97	100	98	95	96	97	102	102		
< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.													

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
1/3 OCTAVE BAND																			
2										OMEGA 3.2									
NOISE SOURCE/SUBJECT:										TEST 71-020-330									
(OPERATION:										RUN 04									
A/M320-4 AIR CONDITIONER										26 AUG 74									
NEAR FIELD NOISE LEVELS																			
(INSIDE HANGER)										PAGE F4									
FREQ (HZ)	DISTANCE (M) -->	4	20	40	60	80	100	120	140	160	180	200	220	240					
25	ANGLE (DEG) -->	0	66<	64<	63<	66<	66<	65<	64<	71<	65<	64<	61<	63<					
31.5		69<	73	71	72	70	69<	71	66<	69<	69<	68<	67<	66<					
40		67<	67<	68	68	70	70	70	69	71	71	70	69	67<					
50		68	70	70	72	71	70	71	70	73	72	73	71	68					
63		80	79	76	74	73	73	73	74	78	80	78	77	73					
80		79	77	76	74	74	73	73	77	79	82	80	78	73					
100		78	77	76	75	78	76	75	75	79	83	83	83	82					
125		95	94	91	92	86	89	88	82	84	87	92	89	81					
160		84	84	81	82	78	80	79	77	79	82	84	80	75					
200		76	77	76	77	79	80	79	78	78	80	83	81	81					
250		80	79	78	81	85	86	83	78	78	79	83	82	80					
315		77	78	80	80	83	85	85	84	81	77	76	77	79					
400		83	82	79	83	83	84	87	84	81	78	76	79	78					
500		85	82	84	81	82	83	81	82	77	75	74	77	77					
630		87	89	91	87	82	89	87	87	82	81	78	83	81					
800		91	90	97	95	92	102	101	95	86	86	85	90	84					
1000		82	83	86	84	85	87	86	83	80	78	77	79	79					
1250		81	87	84	84	83	82	82	87	82	76	76	79	79					
1600		78	80	81	79	78	77	82	80	77	73	72	74	76					
2000		75	77	77	78	76	77	79	80	77	71	71	73	73					
2500		73	76	77	77	76	79	80	82	80	72	71	72	74					
3150		81	85	85	81	78	79	81	82	80	72	73	74	75					
4000		85	88	89	87	80	78	81	83	78	74	75	75	75					
5000		73	75	76	73	72	76	77	78	75	65	64	65	65					
6300		77	81	81	77	77	76	77	78	74	64	64	64	67					
8000		81	86	85	82	80	75	76	77	74	67	65	70	72					
10000		73	74	74	70	68	70	72	73	69	58	57	60	60					
OVERALL		98	99	100	99	96	103	102	98	93	93	95	95	92					

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:											
2	1/3 OCTAVE BAND												
NOISE SOURCE/SUBJECT:		OPERATION:		OMEGA 3.2 TEST 71-020-330									
A/M32C-4 AIR CONDITIONER		COOLING CYCLE		RUN 05									
NEAR FIELD NOISE LEVELS				26 AUG 74									
(INSIDE HANGER)				PAGE F5									
FREQ (HZ)	DISTANCE (M)-->	ANGLE (DEG)-->	4	4	4	4	4	4	4	4	4	4	4
25			62<	63<	63<	65<	71<	70<	69<	69<	69<	69<	71<
31.5			66<	68<	69<	71	72	76	76	76	73	73	74
40			65<	67<	67<	66<	65<	70	71	73	74	74	75
50			67	67	68	69	69	73	74	74	75	75	75
63			73	71	72	76	78	80	77	77	76	76	80
80			71	73	75	75	78	81	79	76	77	78	80
100			79	79	78	79	80	80	80	80	79	80	80
125			86	85	88	88	94	91	83	83	83	88	90
160			78	77	80	78	85	82	79	79	83	85	86
200			80	77	77	77	77	80	79	85	84	83	84
250			81	79	80	79	81	88	84	88	87	85	88
315			79	81	76	76	77	82	84	85	87	89	90
400			76	79	78	80	80	86	85	88	86	88	91
500			80	80	79	77	81	88	89	88	88	86	84
630			86	82	86	85	84	85	96	86	88	91	89
800			83	88	90	90	87	89	94	88	89	99	103
1000			79	80	79	80	82	86	89	86	86	88	90
1250			80	79	80	78	80	87	89	90	87	88	93
1600			75	74	75	75	76	81	85	83	83	87	87
2000			74	73	73	73	73	80	82	80	80	84	87
2500			73	73	72	73	73	78	82	82	81	83	86
3150			76	79	78	77	82	92	95	85	83	85	88
4000			79	80	80	81	86	94	96	87	85	86	87
5000			66	66	66	68	71	79	81	77	78	83	84
6300			68	70	71	75	77	86	89	82	78	81	85
8000			71	74	75	80	82	92	92	84	80	80	83
10000			61	61	62	66	69	80	79	74	71	75	80
OVERALL			93	93	95	95	97	101	103	98	98	102	105

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:	
1/3 OCTAVE BAND											
2										OMEGA 3.2	
NOISE SOURCE/SUBJECT:										TEST 71-020-330	
(OPERATION:										RUN 06	
A/M32C-4 AIR CONDITIONER										26 AUG 74	
NEAR FIELD NOISE LEVELS											
(INSIDE HANGER)										PAGE F6	
DISTANCE (M)--> 2 2 2 2 2 2 2 2 2 2										2 OPERATOR LOCATION	
ANGLE (DEG)--> 160 180 200 220 240 260 280 300 320 340										TEST CONDITION	
FREQ (HZ)										1/8	
25	74	74	71	67	69	68	68	73	74	74	
31.5	73	74	75	70	72	71	72	75	78	81	
40	75	75	75	73	73	71	70	71	71	72	
50	77	76	77	74	74	73	73	73	73	73	
63	82	81	82	80	80	80	79	78	78	81	
80	83	85	83	79	78	77	76	76	79	82	
100	82	85	88	87	87	86	81	81	82	79	
125	91	92	91	90	95	95	88	91	90	90	
160	85	87	87	86	87	86	82	83	82	83	
200	84	83	87	87	87	86	80	81	80	82	
250	83	81	86	88	88	86	82	84	83	90	
315	82	82	81	84	88	85	84	82	82	84	
400	83	83	83	81	82	82	82	80	82	88	
500	83	80	81	86	80	82	84	84	87	93	
630	87	79	81	85	84	83	87	85	90	92	
800	88	87	94	94	90	95	91	90	92	91	
1000	81	79	81	83	85	83	82	82	84	90	
1250	82	80	80	82	87	83	85	80	84	90	
1600	77	74	74	78	80	80	78	77	80	86	
2000	76	73	72	77	82	78	76	73	78	82	
2500	79	72	72	76	79	77	74	73	75	81	
3150	80	72	72	76	81	79	81	80	80	95	
4000	73	73	72	77	82	82	84	86	84	98	
5000	73	67	65	68	70	70	69	69	72	82	
6300	71	69	65	69	72	72	74	74	78	90	
8000	72	71	68	72	75	76	76	77	84	94	
10000	66	60	59	62	64	65	65	66	69	84	
OVERALL	97	97	99	99	99	100	97	97	98	104	

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
1/3 OCTAVE BAND																			
2										OMEGA 3.2									
NOISE SOURCE/SUBJECT:										TEST 71-020-330									
(OPERATION:										RUN 07									
A/M32C-4 AIR CONDITIONER																			
(HEAT CYCLE																			
NEAR FIELD NOISE LEVELS										26 AUG 74									
(INSIDE HANGER)										PAGE F7									
FREQ (HZ)	DISTANCE (M)-->	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
ANGLE (DEG)-->	0	0	20	40	60	80	100	120	140	160	180	200	220	240					
25	70<	66<	63<	62<	63<	63<	63<	63<	63<	61<	62<	63<	64<						
31.5	68<	66<	67<	67<	68<	68<	68<	68<	68<	69<	67<	69<	66<						
40	65<	63<	66<	67<	69	69	69	69	68	69	68	70	66<						
50	67	66	67	69	68	69	69	69	69	70	70	69	66						
63	75	75	73	70	69	72	71	72	72	75	75	74	73						
80	76	75	70	70	70	70	73	73	72	74	76	77	74						
100	73	72	71	73	70	75	76	75	73	73	74	77	76						
125	95	91	84	89	83	83	86	79	83	85	91	93	90						
160	87	83	78	82	76	79	76	76	77	79	84	86	82						
200	75	75	73	74	78	78	79	80	75	76	78	83	80						
250	79	76	78	81	86	84	84	83	80	76	82	84	83						
315	76	76	80	80	84	85	85	85	82	78	75	74	76						
400	84	81	80	83	82	84	85	88	87	82	78	75	80						
500	82	79	81	81	81	81	84	84	81	77	77	76	80						
630	84	87	87	85	83	83	84	85	84	81	78	80	80						
800	90	90	96	96	91	91	96	98	90	88	88	88	89						
1000	81	82	84	84	84	84	85	85	82	77	77	77	78						
1250	80	86	84	83	81	81	83	81	86	80	75	73	77						
1600	76	81	80	78	78	78	77	81	76	74	74	73	77						
2000	74	77	78	78	75	75	78	80	80	76	70	70	72						
2500	73	75	77	76	76	76	79	81	82	79	71	69	71						
3150	81	85	84	82	80	80	80	81	83	80	71	71	72						
4000	85	90	87	88	84	84	82	82	83	79	73	72	75						
5000	73	76	76	74	74	74	77	78	80	75	65	63	65						
6300	78	81	79	75	75	75	74	77	78	73	64	63	65						
8000	84	88	86	81	78	77	77	79	79	73	67	68	69						
10000	71	73	75	70	69	69	71	73	74	68	58	56	59						
OVERALL	98	98	98	99	96	96	98	99	96	93	95	96	95	93					

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
1/3 OCTAVE BAND																			
2										OMEGA 3.2									
NOISE SOURCE/SUBJECT:										TEST 71-020-330									
(OPERATION:										RUN 08									
A/M32C-4 AIR CONDITIONER (HEAT CYCLE										26 AUG 74									
NEAR FIELD NOISE LEVELS (PAGE F8									
(INSIDE HANGER)																			
FREQ (HZ)	DISTANCE (M)-->	4	260	280	300	320	340	4	2	20	40	60	80	100	120	140	2	2	2
25									66<	74	73	67<	66<	69<	70<	70<			
31.5		66<	66<	66<	64<	68<	61<	70<	73	74	73	72	72	72	72	71			
40		65<	65<	64<	64<	63<	62<	69	70	68	70	71	74	74	74	73			
50		65	70	64<	65	66	65	69	70	69	70	71	73	73	73	72			
63		69	78	70	73	73	76	75	75	74	74	75	74	75	76	76			
80		69	72	72	72	73	76	76	76	76	72	72	75	78	78	77			
100		74	75	74	74	74	73	76	77	77	77	76	76	79	79	77			
125		89	92	90	90	90	93	92	88	92	88	84	81	89	89	88			
160		81	84	82	82	82	85	85	82	84	82	80	80	85	86	86			
200		78	74	75	75	76	75	78	79	79	79	83	84	83	84	82			
250		81	79	79	79	78	76	91	84	91	84	89	88	86	91	90			
315		77	78	74	74	75	75	84	86	86	84	86	88	90	91	85			
400		77	77	77	81	79	79	87	86	87	86	90	88	89	93	86			
500		79	81	81	78	82	81	93	89	89	89	89	88	86	85	85			
630		81	80	80	83	84	82	88	93	93	95	85	88	89	90	88			
800		90	91	88	91	86	86	86	89	89	96	85	88	95	100	97			
1000		79	81	79	80	82	82	85	87	87	90	85	86	88	90	89			
1250		77	78	80	80	79	80	87	90	90	89	88	88	89	89	92			
1600		75	74	76	76	75	76	83	86	86	85	84	83	85	87	87			
2000		73	72	73	73	74	72	80	82	82	82	80	80	84	86	87			
2500		72	71	71	71	71	72	78	80	80	82	81	82	85	86	92			
3150		77	73	76	75	75	83	89	89	89	90	84	83	85	88	91			
4000		79	77	80	83	86	86	93	93	93	95	89	88	87	87	88			
5000		67	66	66	66	69	71	80	80	80	82	78	78	84	85	87			
6300		66	66	69	69	72	73	86	88	88	86	81	77	81	86	86			
8000		71	72	74	78	78	80	92	94	94	91	87	80	81	85	86			
10000		61	60	62	65	65	66	77	80	80	80	73	72	76	80	82			
OVERALL		94	96	94	94	95	96	101	102	102	103	98	98	100	103	102			

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
OCTAVE BAND																			
2										OMEGA 3.2									
NOISE SOURCE/SUBJECT:										TEST 71-020-330									
(OPERATION:										RUN 02									
(A/M32C-4 AIR CONDITIONER																			
(NEAR FIELD NOISE LEVELS										26 AUG 74									
((INSIDE HANGER)										PAGE J2									
FREQ (HZ)	DISTANCE (M) -->	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
ANGLE (DEG) -->	260	260	280	300	320	340	0	20	40	60	80	100	120	140	2	2	2	2	2
31.5	66	66	66	66	66	65	73	72	73	73	72	74	74	74	74	74	74	74	74
63	70	70	72	72	74	75	76	75	75	75	76	78	79	79	79	79	79	79	79
125	83	88	86	86	84	90	91	89	85	81	81	86	88	88	88	88	88	88	88
250	81	81	77	77	79	77	84	85	86	89	89	91	91	91	91	91	91	91	91
500	80	82	82	82	83	82	91	91	93	89	90	90	92	92	92	92	92	92	92
1000	87	86	89	89	88	82	89	89	94	89	89	95	95	93	93	93	93	93	93
2000	75	74	75	75	75	75	82	84	85	84	84	87	87	90	90	90	90	90	90
4000	78	77	81	81	84	84	96	93	95	90	88	87	87	90	90	90	90	90	90
8000	72	72	74	74	77	79	92	94	90	85	84	84	84	88	88	88	88	88	88
OVERALL	90	92	92	92	92	93	100	99	100	96	96	98	99	101	99	99	99	99	99

[illegible]

TABLE#	MEASURED SOUND PRESSURE LEVEL (DB)	IDENTIFICATION#
2	OCTAVE BAND	OMEGA 3.2
		TEST 71-020-330
		RUN 05
		26 AUG 74
		PAGE J5
NOISE SOURCE/SUBJECT:	OPERATION:	
A/M32C-4 AIR CONDITIONER	COOLING CYCLE	
NEAR FIELD NOISE LEVELS		
(INSIDE HANGER)		
FREQ (HZ)	DISTANCE (M)-->	ANGLE (DEG)-->
31.5	70	71
63	76	76
125	87	86
250	84	84
500	87	85
1000	86	89
2000	79	78
4000	81	83
8000	73	75
OVERALL	93	93
	95	95
	97	97
	101	101
	103	103
	98	98
	102	102
	105	105

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:									
OCTAVE BAND											
2											
NOISE SOURCE/SUBJECT:		OPERATION:									
A/M32C-4 AIR CONDITIONER											
NEAR FIELD NOISE LEVELS		COOLING CYCLE									
(INSIDE HANGER)											
		PAGE J6									
DISTANCE (M)-->		2	2	2	2	2	2	2	2	2	2
ANGLE (DEG)-->		160	180	200	220	240	260	280	300	320	340
FREQ (HZ)		TEST CONDITION 1/8									
31.5		79	79	79	75	76	75	75	77	80	82
63		86	87	86	83	83	82	81	81	82	85
125		92	94	94	92	96	96	90	92	91	91
250		88	87	90	91	92	91	87	87	87	92
500		89	86	86	89	87	87	89	88	92	96
1000		90	88	95	95	93	96	92	91	93	95
2000		82	78	78	82	85	83	81	79	83	88
4000		82	76	75	80	85	84	86	87	85	100
8000		75	73	70	74	77	78	77	79	85	96
OVERALL		97	97	99	99	99	100	97	97	98	104

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)														IDENTIFICATION:	
OCTAVE BAND															
2														OMEGA 3.2	
NOISE SOURCE/SUBJECT:														TEST 71-020-330	
(OPERATION:														RUN 07	
(A/M32C-4 AIR CONDITIONER															
(NEAR FIELD NOISE LEVELS														26 AUG 74	
((INSIDE HANGER)														PAGE J7	
FREQ	DISTANCE (M)-->	4	4	4	4	4	4	4	4	4	4	4	4	4	4
(HZ)	ANGLE (DEG)-->	0	20	40	60	80	100	120	140	160	180	200	220	240	
31.5		73	70	71	71	72	71	72	71	72	71	73	71	71	69
63		79	78	75	74	74	76	76	76	78	79	79	77	77	74
125		96	91	85	90	84	87	82	84	86	92	94	91	91	80
250		81	80	83	84	88	88	88	84	82	84	87	85	83	
500		88	89	88	88	87	88	91	89	85	82	82	84	85	
1000		91	92	96	97	92	97	98	92	89	88	88	90	90	
2000		79	83	83	82	81	83	85	86	82	76	76	77	80	
4000		87	91	89	89	86	85	85	87	83	75	75	77	81	
8000		85	89	87	82	80	80	82	82	77	69	69	71	72	
OVERALL		98	98	98	99	96	98	99	96	93	95	96	95	93	

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
OCTAVE BAND																			
2										OMEGA 3.2									
NOISE SOURCE/SUBJECT:										TEST 71-020-330									
(OPERATION:										RUN 08									
(HEAT CYCLE																			
(NEAR FIELD NOISE LEVELS										26 AUG 74									
((INSIDE HANGER)										PAGE J8									
FREQ	DISTANCE (M)-->	4	4	4	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2
(HZ)	ANGLE (DEG)-->	260	280	300	320	340	0	20	40	60	80	100	120	140					
31.5		69	69	70	69	70	76	75	75	75	76	77	77	76					
63		73	79	75	76	79	79	78	77	77	79	81	81	80					
125		89	92	90	91	94	93	93	89	85	84	90	91	90					
250		84	82	81	81	80	92	92	87	91	91	92	94	92					
500		84	84	86	87	86	95	95	96	93	93	93	95	91					
1000		91	91	89	91	88	91	94	97	91	92	96	100	99					
2000		78	77	78	78	78	86	88	88	87	86	89	91	94					
4000		81	78	81	83	87	95	94	97	90	90	90	91	93					
8000		72	73	75	79	81	93	95	92	88	82	85	89	89					
OVERALL		94	96	94	95	96	101	102	103	98	98	100	103	102					

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:											
2		OMEGA 3.2											
NOISE SOURCE/SUBJECT:		TEST 71-020-330											
A/M320-4 AIR CONDITIONER		RUN 09											
NEAR FIELD NOISE LEVELS		26 AUG 74											
(INSIDE HANGER)		PAGE J9											
DISTANCE (M)-->		2											
ANGLE (DEG)-->		160											
FREQ (HZ)		2	180	200	220	240	260	280	300	320	340	2	OPERATOR LOCATION 1/C
31.5		76	76	75	72	74	74	74	77	79		79	82
63		81	82	80	79	77	75	76	76	79		79	81
125		90	96	95	92	97	97	92	95	94		94	95
250		89	87	90	90	92	91	88	87	84		84	92
500		89	88	87	91	87	89	91	89	92		92	96
1000		92	90	94	96	96	92	91	89	93		93	95
2000		83	78	77	85	85	84	81	79	83		83	88
4000		82	80	76	82	83	85	83	84	88		88	99
8000		76	70	69	71	76	79	81	81	81		81	96
OVERALL		97	98	99	99	101	100	97	98	99		99	104

TABLE: MEASURES OF HUMAN NOISE EXPOSURE													IDENTIFICATION:
3													
NOISE SOURCE/SUBJECT:													
(OPERATION:)													
(VENT CYCLE)													
A/M32C-4 AIR CONDITIONER ()													
NEAR FIELD NOISE LEVELS ()													
(INSIDE HANGER)													
DISTANCE (M)--> 4 4 4 4 4 4 4 4 4 4 4 4 4													
ANGLE (DEG)--> 0 20 40 60 80 100 120 140 160 180 200 220 240													
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC 96 95 96 95 92 96 96 95 91 90 93 92 91													
OASLA 92 95 96 94 91 95 95 94 89 84 87 88 89													
T 120 71 60 85 143 71 71 85 202 480 285 240 202													
MINIMUM QPL EAR MUFFS													
OASLA* 73 71 70 69 67 70 70 68 66 68 70 69 66													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA* 68 66 64 63 62 64 64 62 60 63 65 64 60													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
V-51R EAR PLUGS													
OASLA* 67 68 71 70 67 71 71 69 64 61 64 65 66													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA* 53 54 57 56 53 57 57 55 50 47 51 51 52													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
H-133 GROUND COMMUNICATION UNIT													
OASLA* 65 67 67 66 63 67 67 66 62 58 61 61 62													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL 84 85 87 86 84 87 89 87 83 78 79 80 82													
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)													
TONE CORRECTION (C IN DB)													
PNLT 110 113 113 111 107 110 110 108 105 100 103 104 105													
C 3 4 4 4 3 4 4 3 3 3 4 4 4													
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.													

TABLE: MEASURES OF HUMAN NOISE EXPOSURE	IDENTIFICATION:												
3													
NOISE SOURCE/SUBJECT:	OMEGA 3.2												
	TEST 71-020-330												
	RUN 02												
A/M32C-4 AIR CONDITIONER	26 AUG 74												
NEAR FIELD NOISE LEVELS	PAGE W2												
(INSIDE HANGER)													
DISTANCE (M)-->	4	4	4	4	4	4	4	4	4	4	4	4	4
ANGLE (DEG)-->	260	280	300	320	340	0	20	40	60	80	100	120	140
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC	90	91	92	92	92	99	98	99	96	96	98	99	101
OASLA	88	87	90	90	88	99	98	99	95	94	97	98	101
T	240	285	170	170	240	36	42	36	71	85	50	42	25
MINIMUM QPL EAR MUFFS													
OASLA*	65	68	67	67	70	74	74	73	71	71	73	74	74
T	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA*	60	63	62	61	65	69	69	68	66	66	68	69	68
T	960	960	960	960	960	960	960	960	960	960	960	960	960
V-51R EAR PLUGS													
OASLA*	64	64	66	66	63	71	71	73	69	69	73	72	76
T	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA*	50	50	52	52	50	57	57	59	54	54	58	58	62
T	960	960	960	960	960	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT													
OASLA*	60	60	62	62	62	71	69	71	66	66	69	70	74
T	960	960	960	960	960	960	960	960	960	960	960	960	960
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL	81	80	82	82	80	88	88	91	87	87	91	92	94
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PND8)													
TONE CORRECTION (C IN DB)													
PNLT	103	103	106	106	107	118	116	117	113	111	112	113	117
C	3	3	4	3	3	4	3	3	3	2	3	1	4

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE																IDENTIFICATION:	
3																	
NOISE SOURCE/SUBJECT: (OPERATION:)																OMEGA 3.2	
A/N32C-4 AIR CONDITIONER (VENT CYCLE)																TEST 71-020-330	
NEAR FIELD NOISE LEVELS ()																RUN 03	
(INSIDE HANGER) ()																26 AUG 74	
																PAGE H3	
DISTANCE (M)--> 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2																	
ANGLE (DEG)--> 160 160 180 200 200 220 240 260 280 300 320 340																OPERATOR LOCATION	
																1/A	
HAZARD/PROTECTION																	
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR																	
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR																	
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)																	
NO PROTECTION																	
OASLC																101	
OASLA																101	
T																25	
MINIMUM OPL EAR MUFFS																	
OASLA*																76	
T																960	
AMERICAN OPTICAL 1700 EAR MUFFS																	
OASLA*																71	
T																960	
V-51R EAR PLUGS																	
OASLA*																74	
T																960	
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS																	
OASLA*																59	
T																960	
H-133 GROUND COMMUNICATION UNIT																	
OASLA*																72	
T																960	
COMMUNICATION																	
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)																	
PSIL																91	
ANNOYANCE																	
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PND8)																	
TONE CORRECTION (C IN DB)																	
PNLT																120	
C																4	

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE														IDENTIFICATION:	
3														OMEGA 3.2	
NOISE SOURCE/SUBJECT:														TEST 71-020-330	
(OPERATION:														RUN 04	
(COOLING CYCLE														26 AUG 74	
(NEAR FIELD NOISE LEVELS														PAGE H4	
((INSIDE HANGER)															
DISTANCE (M)-->															
ANGLE (DEG)-->															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC															
OASLA															
T															
MINIMUM QPL EAR MUFFS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*															
T															
V-51R EAR PLUGS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*															
T															
H-133 GROUND COMMUNICATION UNIT															
OASLA*															
T															
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL															
ANNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT															
C															

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE													IDENTIFICATION:
3													
NOISE SOURCE/SUBJECT: (OPERATION:)													OMEGA 3.2
A/M32C-4 AIR CONDITIONER (COOLING CYCLE)													TEST 71-020-330
NEAR FIELD NOISE LEVELS ()													RUN 05
(INSIDE HANGER) ()													26 AUG 74
()													PAGE H5
DISTANCE (M)--> 4 4 4 4 4 4 4 4 4 4 4 4 4													2 2 2 2 2 2 2 2 2 2 2 2 2
ANGLE (DEG)--> 260 280 300 320 340 360 380 400 420 440 460 480 500													100 120 140 160 180 200 220 240 260 280 300 320 340
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC 93 93 95 95 97 97 100 102 103 98 98 102 101 105													
OASLA 90 91 92 92 93 93 100 102 103 97 96 100 100 104													
T 170 143 120 120 101 30 21 18 50 60 30 15													
MINIMUM QPL EAR MUFFS													
OASLA* 69 69 70 70 75 76 76 77 73 74 76 76 78													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA* 64 63 65 65 70 71 71 71 68 69 70 71 72													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
V-51R EAR PLUGS													
OASLA* 66 67 68 68 68 73 76 76 72 71 77 75 80													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA* 52 53 55 55 55 59 61 62 58 57 62 61 66													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
H-133 GROUND COMMUNICATION UNIT													
OASLA* 62 63 64 65 66 72 73 75 69 68 72 72 77													
T 960 960 960 960 960 960 960 960 960 960 960 960 960													
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL 84 84 85 85 85 89 93 94 90 90 94 94 96													
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNOB)													
TONE CORRECTION (C IN DB)													
PNLT 105 107 107 107 111 118 121 120 112 111 115 114 119													
C 3 3 3 3 3 4 4 3 2 2 3 2 4													
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.													

TABLE: MEASURES OF HUMAN NOISE EXPOSURE															IDENTIFICATION:
3															OMEGA 3.2
NOISE SOURCE/SUBJECT:															TEST 71-020-330
(OPERATION:															RUN 07
(HEAT CYCLE															26 AUG 74
(NEAR FIELD NOISE LEVELS															PAGE H7
((INSIDE HANGER)															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC	98	97	98	99	95	98	99	96	93	94	4	4	4	4	95
OASLA	94	96	97	98	94	97	98	95	91	89	4	4	4	4	91
T	85	60	50	42	85	50	42	71	143	202	202	202	202	202	143
MINIMUM QPL EAR MUFFS															
OASLA*	75	73	71	73	70	72	73	70	68	72	73	73	73	73	71
T	960*	960	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*	70	68	66	67	65	67	67	65	63	67	68	68	68	66	61
T	960	960	960	960	960	960	960	960	960	960	960	960	960	960	960
V-51R EAR PLUGS															
OASLA*	69	70	73	74	70	74	75	70	67	66	66	66	67	67	67
T	960	960	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*	56	57	59	59	55	59	61	56	53	53	53	53	53	54	53
T	960	960	960	960	960	960	960	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT															
OASLA*	67	68	69	69	66	69	70	67	64	63	64	64	64	64	63
T	960	960	960	960	960	960	960	960	960	960	960	960	960	960	960
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL	86	88	89	89	87	89	91	89	85	82	82	82	82	84	85
ANNNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT	111	114	113	113	109	112	113	110	107	105	104	104	106	106	106
C	3	3	3	4	3	4	4	2	3	3	3	3	3	3	3

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE														IDENTIFICATION:	
3														OMEGA 3.2	
NOISE SOURCE/SUBJECT:														TEST 71-020-330	
(OPERATION:														RUN 08	
(HEAT CYCLE														26 AUG 74	
(NEAR FIELD NOISE LEVELS														PAGE 08	
((INSIDE HANGER)															
DISTANCE (M)-->															
ANGLE (DEG)-->															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
MINIMUM QPL EAR MUFFS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*															
T															
V-51R EAR PLUGS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*															
T															
H-133 GROUND COMMUNICATION UNIT															
OASLA*															
T															
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL															
ANNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT															
C															

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

